# CITY OF HOUSTON

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Environmental Protection Agency
EPA Docket Center (EPA/DC), Mailcode 28221T
Attention Docket ID No. OAR-2008-0699
1200 Pennsylvania Ave. NW.
Washington, DC 20460

Via Federal eRulemaking Portal: http://www.regulations.gov

Re: Comment on the Environmental Protection Agency (EPA) Proposed Rule: National Ambient Air Quality Standards for Ozone, Docket ID No. EPA-HQ-OAR-2008-0699

The City of Houston Department of Health and Human Services (health department) has found adverse health effects associated with ozone at levels lower than the current National Ambient Air Quality Standard for ground-level ozone. The health department, in conjunction with academic partners, has conducted local health impact assessments to evaluate the association between air pollution and two acute health events in Houston: cardiac arrest and asthma attacks. These studies, described in detail below, indicate that ozone is an important trigger for both types of events.

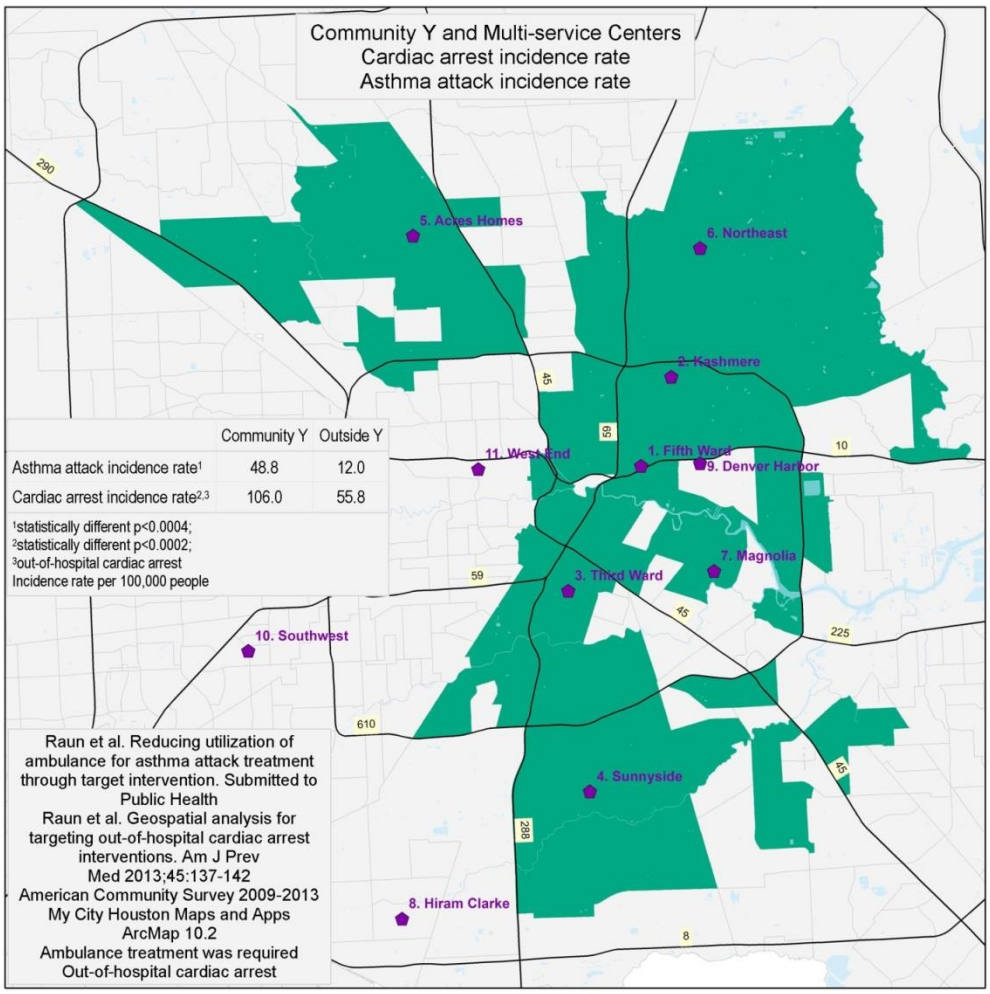
Asthma Study 1: Case-crossover analysis and conditional logistic regression were used to measure the association between ozone, fine particulate matter, nitrogen dioxide, sulfur dioxide and carbon monoxide pollution and 11,754 emergency medical service (EMS) ambulance treated asthma attacks in Houston, Texas from 2004-2011. The results of this study indicate ozone and nitrogen dioxide are important triggers of ambulance treated asthma attacks in Houston (RR = 1.05; 95% CI: 1.00, 1.09), (RR = 1.10; 95% CI: 1.05, 1.15) with 20 and 8 ppb increase in ozone and nitrogen dioxide, respectively, in a multi-pollutant model. Both pollutants are simultaneously high but below the EPA standard at certain times of the year. The risk attributed to these pollutants differs when they are considered together, especially as concentrations increase. Cumulative exposure for ozone (0-2 day lag) is of concern, whereas for nitrogen dioxide the concern is with single day exposure. Persons at highest risk are aged 46-66, African Americans, and males. (Raun et al., 2014)

Cardiac Arrest Study: Case-crossover analysis and conditional logistic regression were used to measure the association between out-of-hospital cardiac arrest (OHCA) and air pollution concentrations on the hours and days before onset of 11,677 emergency medical service logged events between 2004 and 2011 in Houston, Texas. The results of this study indicate an average increase of 6 $\mu g/m^3$ in PM2.5 in the 2 days before cardiac arrest onset was associated with an increase of OHCA risk of 4.6% (95% CI 1.2 to 8.2). A 20 ppb ozone increase for the eight-hour average daily maximum was associated with an increased risk of OHCA on the day of the event of 3.9% (95% CI 0.5 to 7.3). An hourly average increase of 20 ppb ozone indicated increased risk in OHCA during the average one to three hours before the event of 4.4% (95% CI 0.4 to 8.5). Effects were stronger for men, African Americans or those aged over 65. (Ensor et al., 2013)

Asthma Study 2: Case-crossover analysis and conditional logistic regression were used to measure the association between asthma-related pollution triggers, ozone and nitrogen dioxide, in Houston, TX and the risk of EMS ambulance treated child asthma attacks across different school zones during the study period (2004-2013). The results of this study indicate school zones with the highest incidence rates of EMS treated asthma attacks also have the highest risk from a pollution triggered attack even though pollution concentrations between zones were similar. These findings indicate that children in certain school zones are more sensitive to pollution exposure than those in others. There is an increase in relative risk of pollution-triggered child asthma attack at simultaneously high ozone and nitrogen dioxide concentrations of 6% and 37% (RR = 1.06; 95% CI: 1.04, 1.08), (RR = 1.37; 95% CI: 1.29, 1.46) with per ppb increase in ozone and nitrogen dioxide, respectively. In school zones with the highest asthma incidence rates, nitrogen dioxide is an important trigger for child asthma with an increase in relative risk of 11% (RR = 1.11; 95% CI: 1.02, 1.22) with 8 ppb increase in NO2. In all other school zones, the risk from both nitrogen dioxide and ozone was not found to be statistically significant (not yet published).

Both types of acute events in which local health impact assessments have found pollution as a trigger occur at higher rates in a cluster of census tracts across the city (Raun et al, 2013; Raun et al. 2015). The high rate clusters of asthma and cardiac arrest overlay each other. This area is referred to as Community Y in Figure 1 below. The fraction of events attributed to pollution is higher within the high rate regions for asthma. This may also be true for cardiac arrest, although the research has not yet been conducted. Of concern to the health department, is the relationship between ozone and these sensitive subpopulations most vulnerable to pollution.

**Figure 1. Census Tracts in Houston with a High Incidence of Both Cardiac Arrest and Ambulance Treated Asthma Attacks**



**References**

Ensor KB, Raun LH, Persse D. A case-crossover analysis of out-of-hospital cardiac arrest and air pollution. Circulation. 2013 19;127(11):1192-9. doi: 10.1161/CIRCULATIONAHA.113.000027.

Raun LH, Jefferson LS, Persse D, Ensor KB. Geospatial Analysis for Targeting Out-of-Hospital Cardiac Arrest Intervention. Am J Prev Med. 2013 Aug;45(2):137-42. doi: 10.1016/j.amepre.2013.03.013.

Raun LH, Ensor KB, Persse D. Using community level strategies to reduce asthma attacks triggered by outdoor air pollution: a case crossover analysis. Environ Health. 2014 Jul 11;13:58. doi: 10.1186/1476-069X-13-58.)

Raun LH, Ensor KB, Persse D, Yip F. Multi-pollutant, Meteorological and Aeroallergen Characteristics of Days resulting in High Risk for 911 Calls for Asthma. 2015. To be submitted.

Raun LH, Ensor KB, L Campos, Persse D. Factors affecting ambulance utilization for asthma attack treatment: understanding where to target interventions. Public Health. 2015. http://www.publichealthjrnl.com/article/S0033-3506(15)00058-X/abstract

Sincerely,

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